SCRATCHBUILDING AND KIT-BUILDING LOCOMOTIVES

By Phil Knife MMR

With so many excellent ready-to-run locomotives available these days, especially in HO or OO scales, why should we bother to think of building our own? Considering the price of locomotive kits these days compared to those locos in boxes on the dealers' shelves, a reluctance to build your own can be understood. But I can think of some very good reasons why we should be building our own locos, and these I am going to discuss in this presentation. Whether you have ever built a locomotive or not, let me encourage you to have a go, or at least give it some serious thought.

Is the loco I want available off the shelf?

If your layout is set in North America from, say, the late 1950's to the present day then it is almost certain that all the locomotives will be diesels supplied by one of the major builders. The closer you move in time towards the present day, the fewer will be the options available as the builders amalgamate or go under. If you look at the model scene, just about every diesel loco class from first generation units onwards is or has been available ready-to-run in a bewildering array of paint schemes – especially in HO and N scales. There is no need to build your own, but there is a huge after-market of detailing bits and pieces so you can modify the stock models to accurately represent your chosen prototype. This is, of course, a popular form of modelling and some quite stunning results can be achieved. But it is not building your loco from a kit or scratch.

However, if you have chosen to model the steam era, particularly pre-WWII, then the situation is a little different. Yes, there are some lovely ready-to-run model steam locos available off the shelf these days at quite reasonable prices – but by no means did all railroads use USRA standard locos. Before these modern plastic locos there were the brass imports, and many different classes of locomotive were brought out in relatively short runs. These were fine until wages and standards of living in Asia rose to the point when the average modeller could no longer afford to buy brass. These days it is a specialist niche market. But what about kits? Bowser still market their very good Pennsy steam locos, and the generic locos from Roundhouse are still around. But what if you model the Southern Pacific, which did not use USRA standards, and built their own rather unique designs? If you haven't got a brass import, how do you build up your locomotive fleet?

Let's turn our attention to our local scene here in Australia. These days if you model the railways of NSW you can build a convincing layout using only ready-to-run locos and stock, whether steam or diesel era. If you model Victorian, it is not nearly so good, but at least the modern era is well covered off the shelf. But what if, like me, you want to build models of Western Australian steam locos or early diesels – whatever the scale? There is nothing available at all ready to run, and the same applies to all the 3' 6" gauge lines around Australia. How many VR or SAR 5' 3" gauge steam locomotive models are available off the shelf? Not many.

And then there's the British modellers. They appear to be very well catered for indeed with ready-to-run locos from the likes of Hornby and Bachmann, both steam and diesel. But because of the way the railways of Britain evolved, there were literally hundreds of quite different steam locomotive classes. If the British modeller is not modelling post-nationalisation British Railways, then suitable models off the shelf are very scarce.

For the record I'll briefly mention the railways of Europe. If you examine the catalogues of the major European model railway manufacturers, you will see a bewildering array of steam, diesel and electric locomotive models covering all the way from pre-WWI to the present. Perhaps those fortunate individuals don't need to worry about building their own models, as so much appears to be available for them.

Therefore, if there is a particular class of locomotive you want or need for your layout, but it is not available off the dealer's shelf, then you are either going to have to commission someone to build it

for you, or build it yourself. This is the first and strongest argument for building your loco from a kit or from scratch.

I like building models!

There is another equally strong argument – I want to build my own models because I like building them! You might see building a successful working model as a challenge, perhaps to prove to yourself that you can do it. Then again, building model locomotives can be a hobby in itself. And, of course, building your own locos means that you have something running on your layout that is not seen on everybody else's!

At this point, having convinced yourself you want to build a locomotive, how are you going to go about it? Is there a kit available for what you want, or are you going to have to modify something else, or are you going to have to build it from scratch? I got into scratch building back in 1951, when I was just twelve years old. I was a penniless schoolboy with a Hornby clockwork train set, lots of ambition but no funds. There weren't any kits available then, but if there were I couldn't afford them anyway. So I followed a plan in a magazine and built a cardboard loco body and tender, powered by a four-coupled clockwork mechanism. It worked, and I was immensely proud of it. I daresay it was pretty rough by today's standards, but it gave me a taste for building my own.

The Golden Rule

OK – we've decided to build our locomotive. Where do we start? The Golden Rule, as far as I'm concerned, is to have a good, well-running, reliable chassis. If we don't have this, then our locomotive – whether it be built from scratch or a kit – will be a failure. We must get this right or we'll always be disappointed by our loco, no matter how accurate and fine-looking a model it might be. Most of this presentation is about model steam locomotives, for the reasons I stated earlier, although I will make occasional reference to model diesels or electrics. Also, most of this is about HO and allied scales as this is by far the most popular, but the same principles apply to all scales from Z to G, wherever your modelling interests may lie.

The Locomotive Chassis

Whatever we are building, our locomotive chassis comes down to one of three choices:

- To use or adapt an existing ready-to-run chassis
- To build a chassis from a kit
- To build our own chassis from scratch

The dividing line gets a bit fuzzy here – we can use a ready-to-run chassis under a kit or scratch built body, or a kit-built chassis under an existing commercial or a scratchbuilt body, or a scratchbuilt chassis under a commercial or scratchbuilt body. It tends to muddy the strict definitions some people want to place on what makes a scratchbuilt model, doesn't it! But forgetting such political arguments, what is needed is a working chassis for our locomotive.

Using a ready-to-run Chassis

Back in the early days of whitemetal loco kits, the British manufacturers such as K's and Wills produced body kits that were designed for existing chassis from the likes of Triang and Hornby Dublo. While the result was a good-looking model of a prototype that was not commercially available, the end result was usually a compromise as far as wheelbase and wheel sizes were concerned. Furthermore, the wheels were of the coarse standards of the day, although wheels could be changed in these chassis for a better-looking result. All in all, a tolerably accurate model that ran reasonably well was the result.

These days commercially-produced chassis are light years ahead of what they were then. Modern ready-to-run locomotives from manufacturers such as Bachmann, Proto 2000 and Mehano have can motors, blackened rods and valve of near-prototype dimensions, and brake gear. Many of these chassis are available as spares and have a reasonably wide range of possibilities for powering kit and scratch built locomotives. Certainly in this country the cottage industries that support Sn3½ modelling

in Western Australia, South Australia and Queensland rely on these HO chassis for most of their loco kits. Where wheelbases and wheel sizes are tolerably correct, a good looking and good running model will result. However, the old compromises with such details as number and shape of spokes and accurate size remain. Unless you are seeking a high degree of accuracy, and I have no argument with that, using a modern ready-to-run chassis results in a model that you know will run well and not let you down. There may be compromises that you must live with, and that is your choice. I have used Mehano chassis in three of my WAGR Sn3½ kitbuilt models and a Bachmann chassis in another. These are working models and, while not accurate to the nearest millimetre, they look the part and I am happy with them.

Exactly the same argument in favour of a ready-to-run chassis applies to the scratchbuilder. My 1951 clockwork locomotive sits in this category, along with much more accurate models I was building in the early 1960's with cardboard bodies on Triang chassis. Of course the same compromises apply too. You have to ask the question: is the chassis I plan to use exactly correct for the detailed body I am building? Am I prepared to accept the compromise if it is not? It really depends on what you are building the model for. Is it going to be a dead accurate competition winner, or is it going to be a working loco on my layout that looks good at normal viewing distance? Perhaps you don't feel you have the skills just yet to build a reliable working chassis – that is an excellent reason for compromise, when you know that your finished model will at least run well!

This is also where the freelance modeller comes into his or her own. While this can be a contentious area for some people, at least the builder can claim that the wheelbase, wheel size and number of spokes is exactly correct for this freelance prototype! Actually our latest MMR, Frank Godde, did this with his three scratchbuilt freelance On2½ creations for his Master Builder Motive Power certificate. He built a very evocative backwoods four axle diesel switcher for his mining layout that just oozes character. Rightly it received a Merit Award (and I didn't judge it), yet it was built on an HO commercial chassis. You could hardly complain that the wheelbase was wrong – but it certainly looked the part. For the many aspiring scratch and kit builders out there, using a modern ready-to-run chassis has to be an option well worth considering.

Building a Chassis from a Kit

The great majority of locomotive kits that come out of Britain or the USA come with a chassis as part of the kit. In Australia it is the same with the likes of Footplate Models and BGM kits, and those beautiful O-gauge kits of NSW locos. However, as I mentioned earlier, many of the Sn3½ kits rely on a commercial chassis. These Australian and British chassis kits are usually in etched brass or nickel silver, while those from America are solid diecast metal. These latter, found in Bowser and Roundhouse kits, should go together easily – but anyone who has tried to assemble a Roundhouse Shay has found that it does not necessarily work straight from the box. There are also manufacturers who make just chassis kits, usually for replacing the chassis in ready-to-run models with something a bit more accurate. While these chassis kits can be used for just that, they can also be used under scratchbuilt bodies, or even to convert a commercial body into a different prototype. Prominent among these manufacturers is Comet Models in England. They have a wide range of kits for many different British prototype loco chassis, but of course they can be used or adapted to suit something quite different. Most of the earlier Australian locos had a British heritage, so with some careful checking these chassis can be used for local modelling.

I am of the firm opinion that the British lead the world in model locomotive chassis construction. From Britain came model hornblocks and bearings allowing chassis suspension with either compensating beams or springs. Even more recently has come continuous springy beams (CSB), all these allowing all wheels to be in contact with the track at all times, with obvious improvement in electrical pickup and traction. While virtually all chassis kits come as a rigid chassis in basic form, those coming out of Britain these days normally have provision for one of these forms of suspension. One of the main reasons a modeller may choose not to use a suitable ready-to-run chassis for their locomotive is so that they can incorporate one of these forms of suspension – and I am a firm believer in suspension. If you are going to build a kit chassis, you need to make this decision – will I incorporate some form of chassis suspension, or will I build it rigid?

Let me point you to an excellent book to help you not only make this decision, but help you right through the process of building a chassis. The book is *Kit Chassis Construction* by Iain Rice, and it is published in England by Wild Swan. It should be available from good hobby shops in Australia, otherwise you can order from one of the main UK suppliers. If you are going to build a kit chassis – or a chassis from scratch – this book should be by your right hand. Not only does it take you through the whole process step by step, it shows you what tools and jigs are necessary for a successful chassis construction. Do yourself a favour – go and buy this book, if you don't have it already.

Building a Chassis from Scratch

Building a chassis from scratch is not really as difficult as it sounds. Let me assure you, if you can build a successful working chassis from a kit, then building one from scratch is no more difficult. In some ways it is easier, because you don't have to try to work out what the kit designer is trying to do. You are the designer! The only special tool I would recommend is a pillar drill of some sort so you can drill truly vertical holes – a lathe is not necessary. I will mention other tools and jigs a little further on, but right now you will need to decide – do I build my chassis rigid or with some form of suspension? And if the latter, compensation or springing.

Let us begin with a basic rigid chassis. My very first fully scratchbuilt loco, built in 1967, has a rigid chassis. The frames are filed up from 1/16" brass with 1/8" holes drilled through both together for the axles. I bought commercial brass frame spacers to hold the two sides at the correct distance apart, and assembled it using commercially available jigs to keep the axle holes in alignment. It is powered by a Triang motor fixed to the chassis driving the rear axle through Romford gears. The loco is an 0-4-2, the trailing axle riding in a vertical slot in the frames against a simple spring to keep it on the rails. The coupling rods are filed up from rail. Now, forty-two years later, it still runs – even if a bit crude by modern standards.

While the old 1/16" frames can still be used today, there is a lot of work in filing them to the correct profile for your particular model. Even better these days is to make the frames from 10 thou (0.25mm) brass or nickel silver strip. You can buy this, or any other thickness, from the K&S stand at your hobby shop. The thinner metal is much easier to work and takes a lot less heat to solder than the thick stuff. It is amply strong and rigid enough for our purposes, although you will need to purchase (or make, if you have a lathe) flanged brass bearings for the axles. These bearings can be bought for 2mm, 3mm, 1/8" or 3/16" axles, depending on your scale and the wheels you are using. The axle holes are drilled in the frames using the pillar drill, but opened out to take the axle bearings which are soldered in place. A most valuable tool here is a jig, sold by Comet Models of UK, to hold the chassis frames in the correct alignment for the axles while you screw or solder the frame spacers in place. With any rigid chassis, the *essential* thing is to get all the axles parallel and perfectly aligned in both the vertical and horizontal planes. Unless the driving axles are all in alignment, the chassis will never sit squarely on the track, and the coupling rods will bind with every revolution of the wheels. Note well – a rigid chassis might be simpler to build than a compensated or sprung one, but its inherit weakness is in keeping all the wheels on the track together – an impossible task, some might say. I mentioned the coupling rods. The holes in the rods for the crank pins must be *exactly* the same distance apart as the axles, otherwise the chassis will bind with every revolution of the wheels. The only way to achieve this is to drill a pilot hole through the couplings rods and the chassis at the same time – see Iain Rice's book. Can you see now why I am not in favour of a rigid chassis!

Chassis Suspension Systems

And so that brings us to chassis suspension systems – and this applies equally to building a chassis from a kit or from scratch. As I mentioned earlier, there are basically two systems in use in model locomotives, three-point compensation or springing. There are also combinations of the two, but I won't go into that at all. These suspension systems ensure that the locomotive has all its driving wheels on the track, whatever the track irregularities, to the great benefit of electrical pickup and tractive effort. Leading and trailing wheels can also be included if desired, although in a model these are often left to ride along by themselves. The great beauty of these systems is that the chassis frames themselves, unlike with a rigid chassis, don't have to be put together with great accuracy. The "floppy" axles, moving independently of each other, find their own position on the track. Although

adding the hornblocks and compensating beams or springs is more complicated, you don't need a dead accurate chassis to work properly. You pays your money and takes your choice!

Whether you choose to use compensation or springs, the driving axles need to be able to move vertically in the chassis. In all cases, the movement needed is only 0.5mm up and down from the centre line. The normal procedure is to cut a 6mm x 4mm rectangle out of the frames centred on each axle hole. A specially etched plate is soldered over this gap which has a slot to accommodate the turned brass bearings. Everything is kept in alignment while the hornblocks are soldered in place by special jigs which use the coupling rods to ensure correct spacing. This is really quite simple, ensuring a chassis where the axles line up exactly with the coupling rods while free to move vertically in the frames. The necessary hornblocks, jigs and bearings are made by such UK firms as Brassmasters, Perseverance and Alan Gibson Workshop. The necessary jigs, once purchased, will last a modeller's lifetime.

The easiest system to set up is that of three point compensation. This works on the principle of the three-legged stool – all three legs of the stool are always on the ground, however uneven it may be. The normal model railway application is to have one driving axle fixed in the frames, while the other axles have freedom to move up and down. The two fixed bearings of this axle represent two legs of the three-legged stool. The third leg is somewhere on the centreline of the loco at the pivot point of a compensating beam or beams. In the case of the six-coupled loco, the fixed axle is usually the rear one, while there is a beam running fore and aft between the two moving axles, pivoted in the middle between them and bearing on the top of them. The motor is usually geared to drive the rear, fixed axle. This system works very well and is relatively simple to set up. The modeller needs to be careful to ensure that the chassis sits level in the fore and aft direction when installing the compensating beam. Some advanced loco kits have all the components included in the kit for compensation, but for most the necessary extra parts have to be purchased separately. So too, of course, if you are building your chassis from scratch. Again, you can follow this from Iain Rice's book.

There is a draw-back, though, to this style of chassis suspension. By its very nature, the three suspension points are inside the loco's driving wheelbase. That means that there is quite a lot of the loco body at each end that is outside these points. If you are building a whitemetal body, for example a NSWR 32 class 4-6-0, then there is a lot of weight forward of the forward pivot point. If you are not careful with the weight distribution, the model can end up being a bit front heavy, tending to tip forward and sideways at the slightest provocation. But, with putting weight in the right places, this problem is minimised and you have a very well-performing locomotive.

An even better solution is to incorporate springing on all driving axles. Most American brass loco imports since the 1970's have a sprung chassis, but for most of these the springing is far too stiff and is generally ineffective. A sprung chassis is set up in the same way as already described for compensation, except that the driven axle is also able to move vertically in hornblocks. Normally coil springs are used, one on each hornblock, but a horizontal wire can be used instead. Whatever system is used, each spring needs to be able to be adjusted individually. Thus, the chassis has to be set up for the full weight – and weight distribution – of the body. The result should be a loco that "floats" on its springs, allowing each wheel to move up and down as needed to counter track irregularities. This is undoubtedly the best of all the suspension systems, but is the most fiddly to set up.

We haven't quite finished with chassis yet – we need to consider wheels and motors. As far as wheels are concerned the choice is a bit limited. They come in three types: (1) a pair of wheels mounted on an axle and quartered correctly; (2)separate wheels and axles, but with squared axle ends so that the wheels can be easily assembled correctly quartered; and (3) separate wheels and axles, but requiring special care when assembling to get the quartering correct. By quartering I refer to the need to have the left and right hand driving wheels with the crank pins at exactly 90º rotation apart. Already-mounted wheelsets of type (1) are available as spare parts for their kits from Bowser and Roundhouse, and one or two other manufacturers. These are all to the RP25-110 profile, but they are no good for our kit or scratchbuilt chassis as described above, unless you are prepared to take one wheel off the axle and thus convert them to type (3). The type (2) wheels are probably the most common, being represented in HO/OO by Romford/Markits, and in O gauge by Slater's. The range in both scales is

quite good, and the HO/OO wheels are now made with RP25 profile tyres. Of type (3), there is a very big range available in UK by Alan Gibson Workshop, together with a very small range by North Yard in New Zealand. Unfortunately there is no Australian range of driving wheels, only carrying wheels and rolling stock wheels by SEM. There used to be some specifically HO scale wheels made by Sharman Wheels in UK, but unfortunately they are no longer in business. The Gibson wheels, unlike the others mentioned, have plastic spokes and steel tyres. They are made to British EM specifications which are very similar to RP25-88 profile. Like all type (3) wheels, they require careful setting up for correct quartering and back-to-back. I have used these wheels successfully, but I use a special quartering tool to make sure they are set up correctly.

The best motors to use in any kit or scratchbuilt chassis are flat or circular can motors, and the biggest that will comfortably fit inside the locomotive body. There are many gearboxes available to use with these motors, both as kits and made up. You need to choose the best gear ratio for your chosen loco, whether it be for express passenger or for flogging slowly with a long freight train, and the style of gearbox that mounts with the motor in the space available. The motor will need to be restrained with some form of torque arm so that it doesn't rotate around the driven axle. If you've set your chassis up carefully in the first place, it should run smoothly right from when you first apply power to it.

The Locomotive Body

I make no apology for spending so much time and detail on the chassis. No matter how beautiful your locomotive model may be, if it doesn't run properly it will be a continual source of disappointment and frustration to you. Let me now briefly survey the choices available to us for building the rest of the loco and making it our pride and joy. But first I want to state my position on one possibly contentious issue. As far as I'm concerned, there is no best way or best material to build a model locomotive. I have friends who insist that to do a proper job, our model must be made of metal – and that means from sheet metal, not whitemetal castings. What a load of poppycock! Whatever method of construction and material suits you best, and results in a good, working, scale model and brings you satisfaction is correct. Some people prefer to work in metal, others in plastic, others still in the more traditional materials of card and wood. As long as the result is a good, workmanlike job then that is all that is needed. Choose the method and material that suits you best. After all, under a coat of paint it doesn't matter what it is made of – as long as it looks the part and works. Don't be put off by the critics telling you that you are doing it wrong.

The simplest way to build your new model is to take a commercial loco body, chop it around a bit, add extra detail to it and fit your new chassis to it. Nearly all the ready-to-run locomotives available today, steam or diesel, British, continental or American, have a plastic body. I have a few Triang loco bodies, all well over forty years old, none showing any sign of warping or distortion. The plastic revolution has enabled manufacturers to produce incredibly detailed models that are strong and realistic, that we can use as is, or chop them around to make something else. The after-market detail producers have given us an incredible array of detail parts we can use to improve or change our loco models. The model shops still carry the Dapol range of plastic loco kits for OO gauge. With these kits you can build a reasonably accurate non-powered working model for under twenty dollars. They are a great source of plastic loco bodies and parts. They've been around for years, dating back to Kitmaster in the late 1950's, then Airfix. Back in Kitmaster days they used to make a NYC Hudson kit. This found its way on to many layouts of the day with various six and eight coupled commercial chassis as freelance freight locos. In a magazine article around 1960, the writer showed how to take two of these Kitmaster (now Dapol) kits to combine them to make a completely different third locomotive! Such is the flexibility of using commercial plastic loco bodies to build a new loco of your own.

For the American modeller, the Bowser range of loco kits is a good start – provided you are modelling the Pennsylvania Railroad. Their kits have diecast loco bodies and a diecast chassis, as already mentioned. Detailing kits are available as well, containing cast brass detail parts suitable for that loco. They go together quite well, although you can expect to break some drills making the necessary holes in the diecast shells. With care you should end up with a heavy, good running and very satisfactory model. They used to have big open frame motors which almost caused the house lights to dim when

you ran them, but now come with can motors. These Bowser locos are specific prototypes, nearly all Pennsy, and deserve a place on a good layout. On the other hand, the Roundhouse kits are generic by nature and fall short on the detail front. Like the Bowser locos, with care they can be made to run well. I took a Roundhouse Harriman-style 2-8-0 kit and built it as a Southern Pacific C9. I had to change the driving wheels, add a heap of detail parts, build a new tender, and it does look reasonably like a C9 – although I would not claim complete accuracy.

The Australian and British modellers are well catered for with whitemetal kits in both HO/OO and O scales. When I say Australian, I need to confine myself to NSW and Victoria as I am not aware of any other state prototypes being available. From these kits you can build a reasonably representative steam locomotive stud for a layout based on the NSWGR or the VR. Most of these kits (but not all) are made by the UK firm of DJH, who also make kits for their own British market, plus South Africa and some European prototypes. Their Australian kits come complete with wheels, motor and gears, and include chassis parts which make up into a rigid chassis. The boiler, main body parts and detailing parts are all cast whitemetal, while such parts as the tender wrapper and cab sides are etched brass. With care these kits build up into a fine, detailed, working model that runs well. In Australia they are found as Footplate Models, Broad Gauge Models and Steam Era Models, and are an excellent way to hone your own skills while building locos that are not seen on everyone else's layout.

When I moved to Western Australia and eventually took up modelling the WAGR in the 1950's in Sn3½, I discovered the urethane resin kit. While this type of kit is by no means restricted to Western Australia, it was new to me. Resin casting is a process highly suited to very short manufacturing runs in a cottage industry situation. Rubber moulds are made from styrene patterns, then the kit parts are cast in these moulds from the urethane resin. These parts are relatively soft and easy to work, but they are subject to distortion before assembly. They are glued together using superglue gel or 2-part resin (such as 5 minute Araldite). There is a lot of work in preparing the parts for assembly, and urethane resin is not always the most suitable material to use, particularly for thin components. But with care, lots of patience and a steady hand, a very good model can be built. These kits that have been made available so far all use a commercial ready-to-run chassis, most of which require some modification. In my view these kits require a greater degree of skill by the modeller to assemble than the whitemetal kits, but with them some quite unusual prototypes can be built.

At the top end of the kit building ladder is the etched brass and nickel silver kit. These kits are very popular in Britain, where they cover a bewildering array of prototypes. Here in Australia they are much less well known, although I have quite recently had the experience of building what turned out to be a beautiful loco kit made in Melbourne. Alyn Models have brought out just two etched kits, both in Sn3½ scale, the first being a WAGR P class 4-6-2 and the second an Australian Standard Garratt. This latter, of course, was common to several Australian states with the 3'6" gauge and was built as a wartime standard. They were not very popular with the engine men in WA, but the model is big and beautiful. I didn't build one, but I did build the WAGR Pacific. These kits come with voluminous instructions, and are complete with every detail. Wheels, gears and motor are included, and the chassis builds up rigid. All parts of the valve gear are there and working. It was not a simple kit to build, but the result is a strong, good-looking model which is a good runner. Anyone who feels confident building a whitemetal loco kit and getting it working properly should be able to build an etched brass model. Many of the British etched kits are of much simpler locos than I attempted and are not difficult to build. If the loco you want is not available ready to run, or as a whitemetal kit, then either have a go at an etched brass one – or build your own from scratch.

Concluding Thoughts

In wrapping up this presentation I need to say that, whatever loco you are building, whether from kit or scratch, you will need a good drawing of that loco, plus as many photos of the prototype you can find. These photos need to be from around the same period your loco is meant to represent. Steam locomotives were around for a long time, usually many decades, and in that long life often underwent changes and even rebuilding. If your model is to be accurate, you will need to carefully research its prototype. A good drawing can often be hard to find and this adds to your difficulties. At least for the NSWGR modeller, there is the excellent Datasheets range readily available. If you want to model the

WAGR, like me, then accurate drawings are hard to find. There are very few decent published drawings. In that case good photos are essential, and it is even better if you can look at, climb over, photograph and measure your chosen loco if it happens to be in a local railway museum.

But my answer is to persevere! Don't be afraid to give scratch-building a go – even if your first attempt isn't so great, it is at least your own work and you can be proud of it. We are fortunate that there are some very good kits around for many different prototypes, so start with them. As always in most endeavours, the hardest part is getting started. But whatever you may build, remember that the most important part is the chassis. If you don't have a good, accurate, well-running chassis that stays on the track, then you don't have a good model, no matter how nice the body might be. For your next loco, think about some form of suspension, as it does make a big difference to the overall performance. Above all, remember that this is a hobby, it is meant to be enjoyed and not taken too seriously. As the *Model Railroader* used to say on its cover, Model Railroading is Fun!